

Prevalence of Musculoskeletal Discomfort among Women Working in Khakhra Making Units

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Abstract

The National Commission on Self-Employed Women estimates that 93.46% of labour force will be employed in the informal sector by the end of the 12th Five Year Plan. The plight of women in this sector is miserable as they work for low wages, with a total lack of job and social security benefits, long working hours and unsatisfactory working conditions. The khakhra (thinly rolled out chapattis which are made crisp over a griddle) industry mainly employs women.

The objectives of the study is to understand the tasks involved in the khakhra industry and to identify the level of musculoskeletal discomfort experienced by the women working in this industry.

A field study was conducted in 18 khakhra units from Thane district in Maharashtra state. Convenient and purposive sampling method was employed. The participants included 300 women (30 – 50 years). The participant's background information was obtained through a proforma. They were interviewed and observations for each participant were made so as to obtain a comprehensive representation of the women engaged in the khakhra making industry. In addition to the interview, a measurement scale, viz, Modified Cornell Musculoskeletal Discomfort Questionnaire was administered.

The tasks included kneading and rolling the dough into thin chapatis and roasting them to make khakhras. Majority of employees were involved in rolling (90%) and roasting (76%). Very few were involved in kneading (44%). Most women preferred to rest for shorter duration because of inadequate rest area. Additionally many reported that longer break resulted in less work done leading to low per day income. There was a high prevalence of upper and low back pain which interfered with their ability to perform efficiently. General tiredness and medium level responsibility at home prevented them from taking other part-time jobs.

KEYWORDS: Women, Health, Sustainability, Discomfort, Ergonomics.

Introduction:

According to 2011 census, women constitute 48.46% of the total population in India and about 25.67% of female population is designated as workers. By 2017, and estimated 93.46% of the labour force (at 5% GDP growth) will be employed in the informal sector (Source: National Commission on Self-Employed Women). It is further stated that the unorganized sector in India, will be a woman dominant sector.

At present however, the plight of women in this sector needs immediate attention as they work for extremely low wages. This includes lack of job security and social security benefits, long working hours and unsatisfactory working conditions.

Studies conducted in several parts of the country indicate an unpleasant working condition of the women workers in the unorganised sector. They continue to face discrimination and marginalization both subtle and blatant (Source: Asian Journal of Multidimensional Research). Women and girls are more likely to invest their earnings in their children and shoulder major life sustaining family responsibilities. Also they perform dual role of employment in harsh working conditions and also manage their homes efficiently.

The major problems they face are poverty, lack of access to education and inadequate healthcare facilities.

- It is observed that the women in the khakhra* (thinly rolled out chapattis which are made crisp over a griddle) making units are appointed on contract basis.

Living in poverty, most women in the khakhra making units barely manage a subsistence existence.

Of the several factors responsible for their plight are indifferent attitude of the employers towards women workers, their weak bargaining power and in many cases the women workers themselves being unaware of their rights. From observation, it can be easily estimated that these women working in unorganized sector are living a life far below from satisfaction.

The objectives of the study is to

- i. understand the tasks involved in the khakhra industry and
- ii. study the frequency of musculoskeletal discomfort among able-bodied women working in this industry.

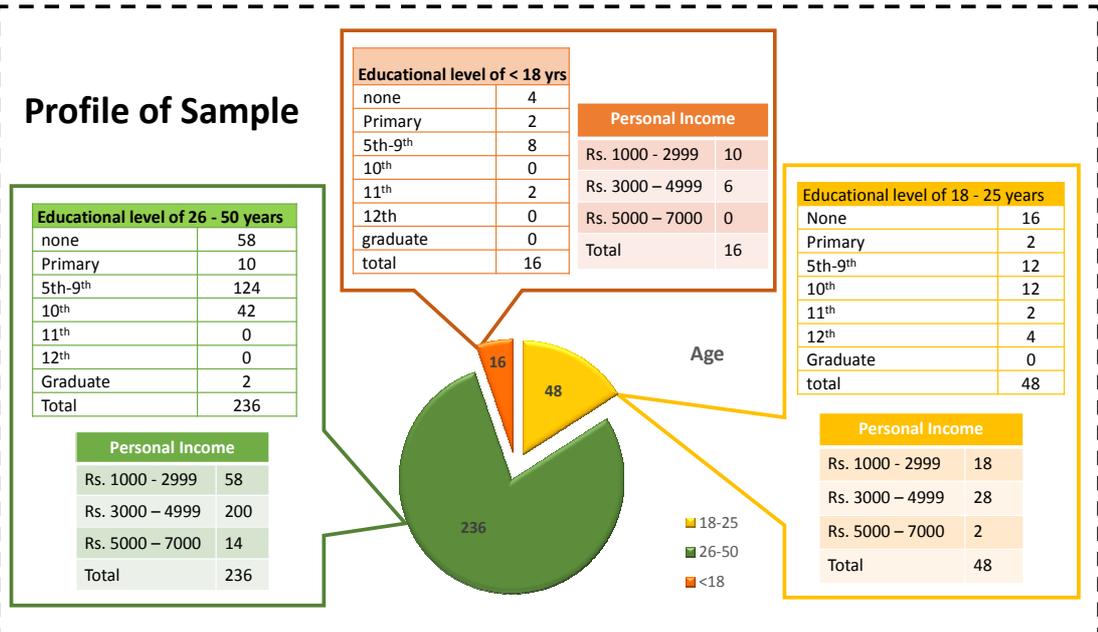
Methodology: A field study was conducted in 18 khakhra units from major geographical areas of Thane district in Maharashtra state. The convenient (permission to conduct the study) and purposive sampling method was employed. Participants included 300 women upto 50 years. The participant's background information was obtained through a proforma collecting personal information, such as educational qualifications, marital status, economic status, etc. They were interviewed (self-constructed) and observations for each participant during a one week period so as to obtain a comprehensive representation of the women engaged in the khakhra making industry. In addition to the interview (duration 10 minutes) a measurement scale namely, Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) was administered (15 – 20 minutes) to study the frequency of musculoskeletal discomfort among able-bodied women working in the khakhra making units. Cornell Musculoskeletal Discomfort Questionnaire (CMDQ), is based on the Nordic musculoskeletal symptom survey (Kuorinka et al., 1987).

* Khakhra are thinly rolled out chapattis which are made crisp over a griddle. Khakhra is a popular tea time snack. It can be eaten as chips with a dip, topped with stuff and eaten as chat or just eaten with a cup of tea. Most of the vegetarian going abroad carry khakhra to survive for few days as khakhra can be stored for a month. There are several varieties of khakhra such as methi, jeera, bajri, masala, pav bhaji, panipuri, diet khakhra to name a few. This industry mainly employs women.

Coding of the CMDQ: The Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) was coded with numbers reflecting severity of discomfort and interference with work. Right and left sides were combined, with the highest rating given recorded for the body part. For example, if the participant selected once every day for discomfort in the right shoulder but never for the left shoulder, the response for shoulder was coded as 3

Response	Code
Never or Not at All	0
1-2 times last week	1
3-4 times last week	2
Once every day	3
Several times every day	4
Level of Discomfort: Slightly uncomfortable	1
Level of Discomfort: Moderately uncomfortable	2
Level of Discomfort: Very uncomfortable	3
Interference with work: Not at all	0
Interference with work: Slightly interfered	1
Interference with work: Substantially interfered	2

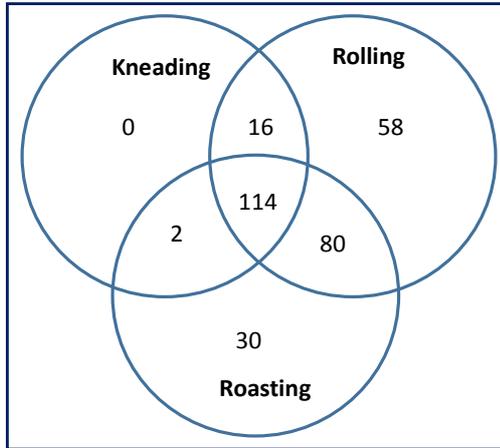
Results and Discussions:



Highlights of the sample profile (figure 1) is as follows:

- 236 women (79%) were of 26 – 50 years in age
- Maximum income earned in the khakhra making job is Rs. 7000.
- Majority of the women were school dropouts. 1.33% had successfully passed their grade 12th exams and 2 women (0.66%) were graduates.
- Permitted rest period is 30 – 45 minutes but the women preferred to take rest pauses of lesser duration because longer rest means less production resulting in less wages (payment is on per kilogram produced).
- 86% of them are married, 13% single and less than 1% (2 women) widowed.
- All women have household responsibilities which includes strenuous tasks of filling water for kitchen as well as bathroom.

- Due to the heavy job and household energy demands, none of them had any other forms of gainful employment.

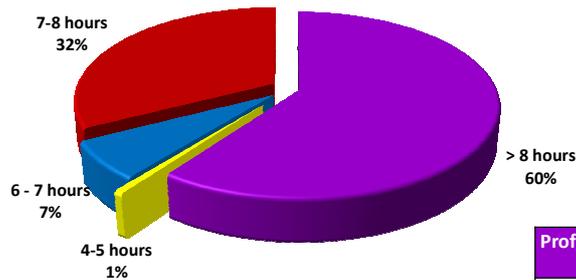


The tasks included kneading the dough, rolling the dough into thin chapatis and roasting the chapatis to make khakhras. Majority of employees were involved in rolling (90%) and roasting (76%). Very few were involved in kneading (44%). Only, 38% were involved in all three tasks (i.e. kneading, rolling and roasting). Work shift comprised of 7 – 10 hours and payment was made on basis of work accomplished. Rest period ranged from 15 – 45 minutes depending on employee needs.

Profile of women working for 7 – 8 hours	
< 18 years	8
18 - 25 years	12
26 - 50 years	78
Total women	98

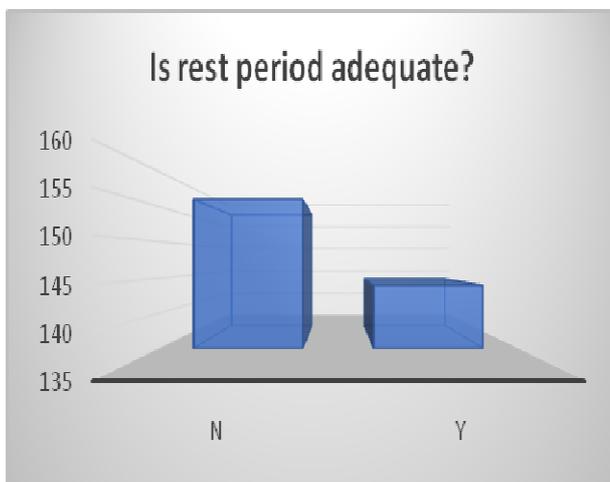
WORKING HOURS

Profile of women working for 6 - 7 hours	
< 18 years	2
18 - 25 years	2
26 - 50 years	16
Total women	20



Profile of women working for 4 – 5 hours	
< 18 years	0
18 - 25 years	0
26 - 50 years	2
Total women	2

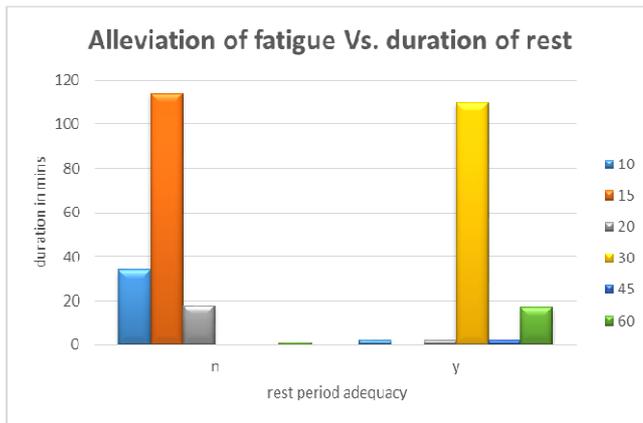
Profile of women working more than 8 hours	
< 18 years	6
18 - 25 years	34
26 - 50 years	140
Total women	180



It was evident that 15 minutes rest period was not sufficient (71% of the respondents were not satisfied with 15 minutes rest period) to recover completely and 30 minutes rest period (76% of the respondents felt they were satisfied with 30 minutes as time taken to rest) was considered to be ideal. But most women preferred to rest for shorter duration because of inadequate or nil rest area. Additionally many reported that longer break equalled to less work done leading to less

money earned per day.

General tiredness/fatigue and medium level responsibility at home front prevented



them from taking other part-time jobs. To add to their woes they faced problems at household level (i.e 6-7 hours electricity cut-offs and water supply once every 3-4 days). Many of them had poor sanitary facilities too.

The layout of the workplace (manufacturing unit) was studied for relevant physical working environment factors (such as

lighting, heat & ventilation) and safety parameters (such as blind corners, type of flooring, working heights).

- **Lighting:** The illumination levels was inadequate (Cornell Task lighting Evaluation scale) in 8 out of the 18 units (44%) studied. The quantity of illumination relates to the amount of light that exists or is required at a workplace. The units were equipped with electrical light fixtures which were not utilised in spite of poor lighting levels. This resulted in many of the women adopting awkward postures to complete the tasks at hand.
- **Ventilation:** The main purpose of ventilation is to provide fresh air and to remove accumulated noxious gases and contaminants. Ventilation helps to remove heat generated in a working area by convection and cools the body. Discomfort is experienced due to the heat generated during the process of roasting khakhras and poor ventilation facilities (less air changes). Heat generated is reported has high (78%) and very high (22%) in all 18 units.
- **Workstation layout:** The layout of the unit has not been planned for efficiency or comfort. There is no organised arrangement made for the tasks. Each activity is undertaken in a separate room. Squatting on the floor is the basic work posture adopted. All three tasks kneading, rolling and roasting require repetitive movement of the upper limb with varying force applications. These two aspects of the work could be the main contributing factors which can lead to fatigue, musculoskeletal disorder (MSD) symptoms and injuries.
- **Rest period:** A defined rest period would help relieve fatigue, but the fear of producing less leading to less wages prevent them from taking more than 15 minutes from the permitted 45 minutes break.
- **Comfort & safety at workplace:** safety at workplace was evaluated by the design features of the manufacturing unit. Employees in all units feel that the heat generated due to the roasting activity compounded by poor ventilation and less frequent air changes caused discomfort which interfered with performance output.

Prevalence of Discomfort: Although Work-related Musculo-Skeletal Disorders (WMSDs) are considered cumulative trauma injuries/illnesses, there has been limited research on the risk associated with the frequency that these activities are performed during the course of workday, workweek, work year, or career. Research on WMSDs, and back injuries in particular, has focused on identifying what the risk factors are and

their relative that the risk factors were length of time in the job and a history of previous back injury.

OSHA's Ergonomics Program Standard (2001) includes a checklist that identifies five risk factors (all of them physical) associated with a WMSD hazard:

- i) Repetition (repeating same motions such as roasting the khakhras every few minutes for 2-4 hours at a time, or rolling the khakhras by using the rolling pin steadily for more than 4 - 6 hours daily)
- ii) Force (required to knead a stiff dough of more than 2 – 3 kgs at a time for 2 - 3 times a day)
- iii) Awkward Postures (sitting on the floor due to inadequate design of workstation, awkward postures adopted due to poor workplace environment conditions, or working with back, neck, wrists bent or twisted for more than 6-8 hours total per day)
- iv) Contact Stress (using the load for roasting the khakhra on a hot girdle or rolling pin for three times every 10 - 15 minutes for more than 6 – 8 hours per day)
- v) Vibration (e.g., using tools or equipment that typically have high vibration levels – not very relevant in this industry)

The World Health Organization (WHO) has classified occupational injuries and illnesses, including back pain and other WMSDs, as multifactorial, indicating that there are many factors (e.g., physical, work organizational, psychosocial, individual, and sociocultural) that cause them (WHO, 1985). NIOSH (1997, p. 1-1) cites this multifactorial etiology as “one important reason for the controversy surrounding work-related WMSDs.”

A common way for determining prevalence of musculoskeletal complaints is through the use of symptom surveys or questionnaires (Engels, van der Gulden, Senden, & van't Hof, 1996; Hedge, Morimoto, & McCrobie, 1999; Kuorinka, et al., 1987; Lemasters, et al, 1998). Corlett and Bishop (1976) recommended using a body map diagram as a way to track musculoskeletal discomfort. Limitations of this tool include the lack of clinical validity testing for it specifically and its development for use as a tool for use in screening for upper body disorders.

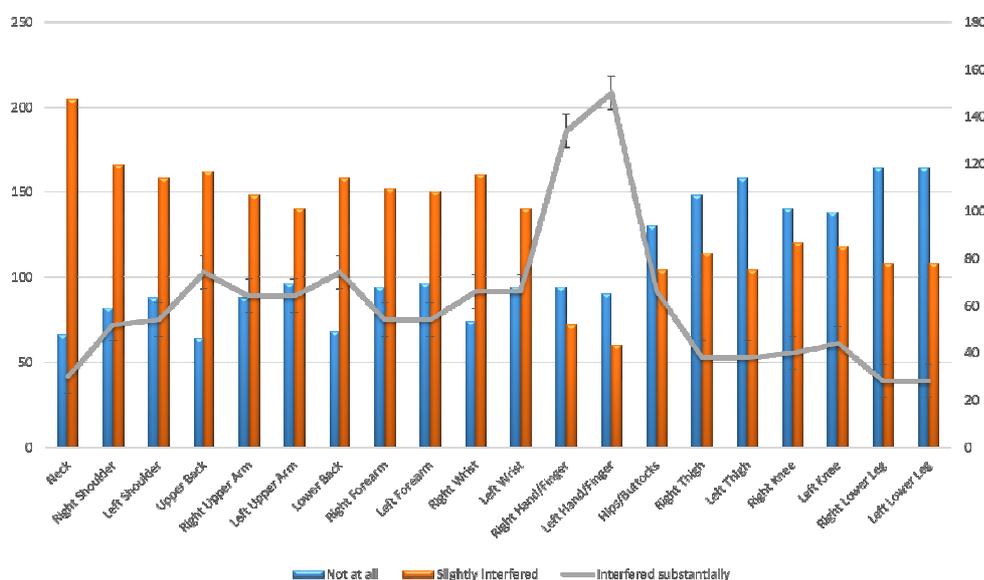
Posture Index by Body Region	
Index Body	Region
Upper Posture Index (UPI)	Neck, Shoulder, Upper Back, Upper Arm, Forearm, Wrist, Low Back
Lower Posture Index (LPI)	Hip/Buttocks, Thigh, Knee, and Lower Leg

Almost 89% of the whole sample reported musculoskeletal discomfort of at least moderate severity in at least one body part in the previous seven days. There was a high prevalence of pain in the wrist (53%) both right and left as well as pain/ache experienced in the hand/finger (50%) which interfered substantially with their ability to perform efficiently. This may be due to fact that there is no platform or raised (2 – 4 inches) work surface which can reduced the force need for rolling or kneading jobs

Table 2: Frequency of pain/ache experienced					
Complaint Region	Number of women who experienced pain/ache				
	Never	1-2 times/week	3-4 times/week	Once daily	Several times a day
Neck	32	62	30	66	110
Shoulder	51	38	28	49	134
Upper Back	54	12	30	80	124
Upper Arm	57	37	21	43	142
Lower Back	60	6	30	72	132
Forearm	64	42	20	34	140
Wrist	56	44	15	26	159
Hand/Finger	63	36	22	30	149
Hips/Buttocks	118	42	24	54	62
Thigh	85	28	30	61	96
Knee	66	26	38	77	93
Lower Leg	82	53	31	58	76

79% reported that the discomfort experienced interfered with their ability to perform work efficiently.

Interference with ability to perform tasks



There is absolutely no scope for claiming compensation for the work related musculoskeletal pains and aches experienced because there is no such system existing in this industry. Moreover the employees fear repercussions from the employers if they even mention the pain/aches.

Recommendations and Ergonomic Guidelines: These khakhra making units provide employment to a large number of women, hence steps must be taken to provide them with a safe working environment. The recommendations

At the administrative level:

- ✓ Job rotation: If possible, job rotation should be used to prevent injury, not as a response to it. Workers should be roistered into jobs using different muscle-tendon groups to prevent fatigue. E.g. alternate heavy kneading of dough with rolling of chapatis to eliminate impending fatigue.
- ✓ Job design: Employers must be aware at ways that jobs can be (re)designed to incorporate good ergonomic practices. These include providing relief from frequent repetitive motions, static or awkward postures, excessive forceful exertions, and mental and muscular fatigue.
- ✓ Monitoring: Regular review of all three activities involved to check if unsafe work practices are being used. Work techniques should be reviewed periodically to ensure that they reduce risks.
- ✓ An attempt to be made to anticipate all possible safety hazards, and emergency measures should be established. For e.g. stove placed near to the gas cylinder, provision to protect against hot girdle while roasting the chapatis.
- ✓ Basic first aid box to be readily available on premises.

At the design stage:

- ✓ It is important to consider both physiological and psychological elements in the design of a workspace.
 - Space should be designed so that proper posture can be maintained, body weight can be properly distributed, cardiovascular action is properly maintained, and the possibility of fatigue is minimized.
 - Provision of service facilities such as group/employee insurance, medical facilities, paid leave will help boost the morale and create a happy employee who will be more efficient.
- ✓ For workspace to be functional, both the employee as well as the work to be performed must be considered. Workspace arrangements should consider worker comfort, physical constraints and performance requirements. Basic considerations regarding the worker that must be taken into account are:
 - Equipment and material that the worker must be able to work with and reach.
 - The amount of communication needed with co-workers and supervisors.
 - Body clearances that are needed by the worker.Workstations should be designed ergonomically, to accommodate a broad variability in human beings, anthropometric data from the 5th to 95th percentile range.
- ✓ Daylight and electrical light are the two major sources of light used in industrial sites. Artificial light is commonly used in industrial buildings during daytime to provide additional local lighting on the work area. The khakhra units must have adequate illumination levels which will help reduce awkward postures adapted during work.
- ✓ Parallel or cross ventilation to enhance air changes and provide thermal comfort to the employees.
- ✓ Gas stoves to be placed on a raised platform to reduce awkward seating postures adopted while roasting chapatis and thus reduce lower back problems.

At employees/ personal level:

- ✓ Regular recovery pauses can help prevent headache, neck, back, shoulder, arm or hand pain. Employees can perform activities that involve different muscle groups during these pauses.
- ✓ Reducing rapid upper limb movements by introducing rolling machines (available in the market).
- ✓ Personal protective equipment (PPE) includes such things as gloves and knee pads that may help reduce hazards until other controls can be put into place, or to supplement existing controls.

The Way Ahead: Khakhra making is a tedious job. Working posture adopted due to poor infrastructure and facilities is dangerous. The local women still prefer to work in these units due to their financial condition. These women have been ignoring the pains and aches felt due to fear of losing their jobs. The very nature of women workers, their lack of awareness and education, the indifferent attitude of the employers, government and the general status of women in society is the cause of being vulnerable. It is the urgent need of the hour that government, Non-Government Organizations (NGOs) and Voluntary Organisations must intervene and efficiently deal with the plight of these women. These organizations must play a vital role in making the women conscious of health related issues, education and above all their rights. Women should be provided adequate and appropriate education and training to enhance their sense of self-worth and self-esteem and to enlighten them regarding their right to good health.

Further research is needed on the following: biomechanical forces on the wrist and forearm during kneading and rolling of khakhra, ergonomic assessment of working environment in the units and psychosocial stressors in addition to the physical workload of these women.

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